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Numerical Simulation of a Sahara Dust Storm Event

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Using an integrated dust-storm modelling system, we simulate the severe Saharan dust episode between 1 March and 10 March 2004. The simulated dust patterns are compared with surface synoptic data and satellite images and the simulations are found to agree well with the observations. The synoptic systems which generated the dust storms and the evolution of the dust patterns are analysed. It is revealed that a cyclone genesis process over central Sahara, accompanied by an anti-cyclone over the Atlantic and a monsoon trough in the tropics, is responsible for the wide spread dust storms in North Africa. Dust first appeared in west Sahara, then in east Sahara and much of the dust emitted from east Sahara is transported to the monsoon trough, resulting in high concentrations floating dust over the Sahel. The main dust source regions are (1] Mauritania, (2] Chad and Niger and (3] Libya, Egypt and Sudan. The region between 10oN and 16oN to 17oN is a region of net dust deposition. We estimate that 780 Mt of dust is emitted from North Africa during the episode, 662 Mt is deposited to the continent and the net dust emission is 118 Mt. Of the 188 Mt, with respect to the model domain, 8 Mt is deposited to the ocean, 89 Mt transported cross the domain boundaries and 21 Mt suspended in the atmosphere.